Hydraulics Updates to the IndianaDesign Manual

Mark Bailey, PE
Manager, INDOT Office of Hydraulics

mbailey1@indot.in.gov

David Finley, PE
INDOT Hydraulics Engineer

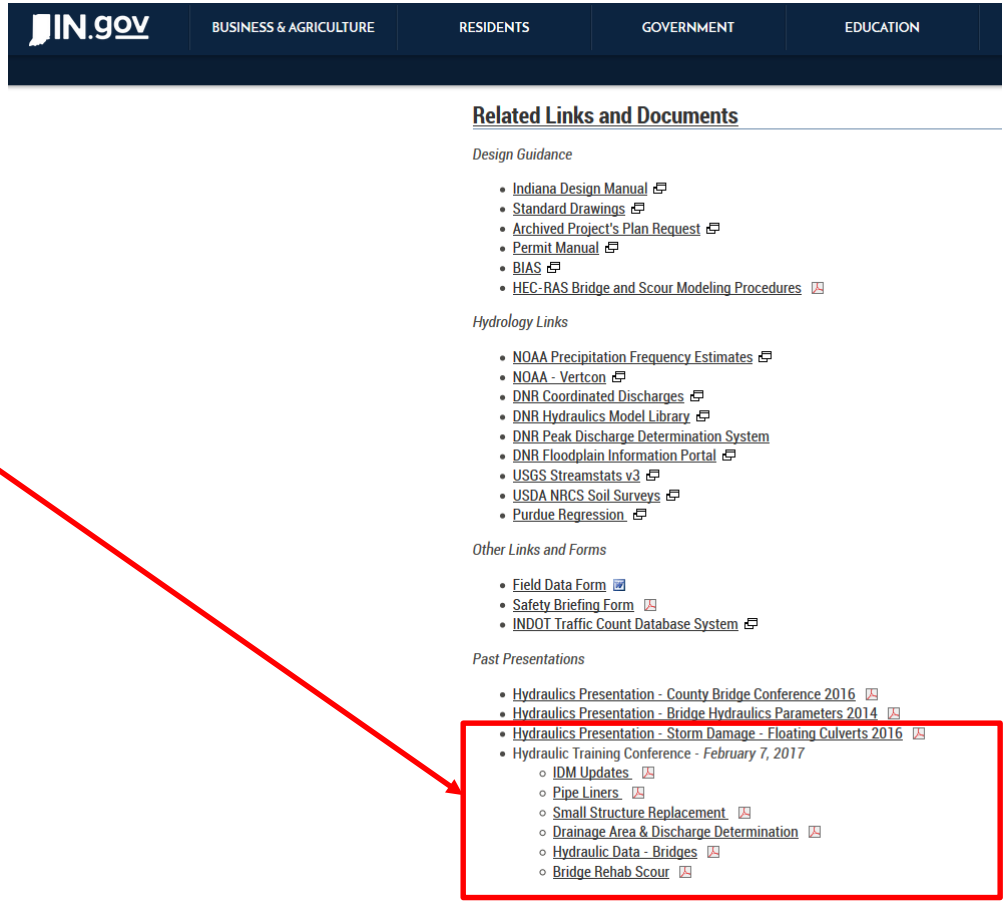
dfinley@indot.in.gov

March 8, 2017

Updates to the IDM

How-to Information

Helpful set of presentations on the Office of Hydraulics website



Updates to the IDM

Status of the current updates…

Updates to the IDM

Bridge REPLACEMENT Updates…

ONE FOOT

Updates to the IDM

Bridge REPLACEMENT Updates…

Backwater…

- **First assess the existing backwater**
- **Basic backwater criteria:**

If the existing backwater is…	*The allowable backwater will be…*
> 3 feet	3 feet or less
Between 0.14 and 3 feet	Match or improve existing
Less than 0.14 feet	Up to 0.14 feet

This can be affected by other factors →

Updates to the IDM Bridge Replacement

Backwater: Check velocity…

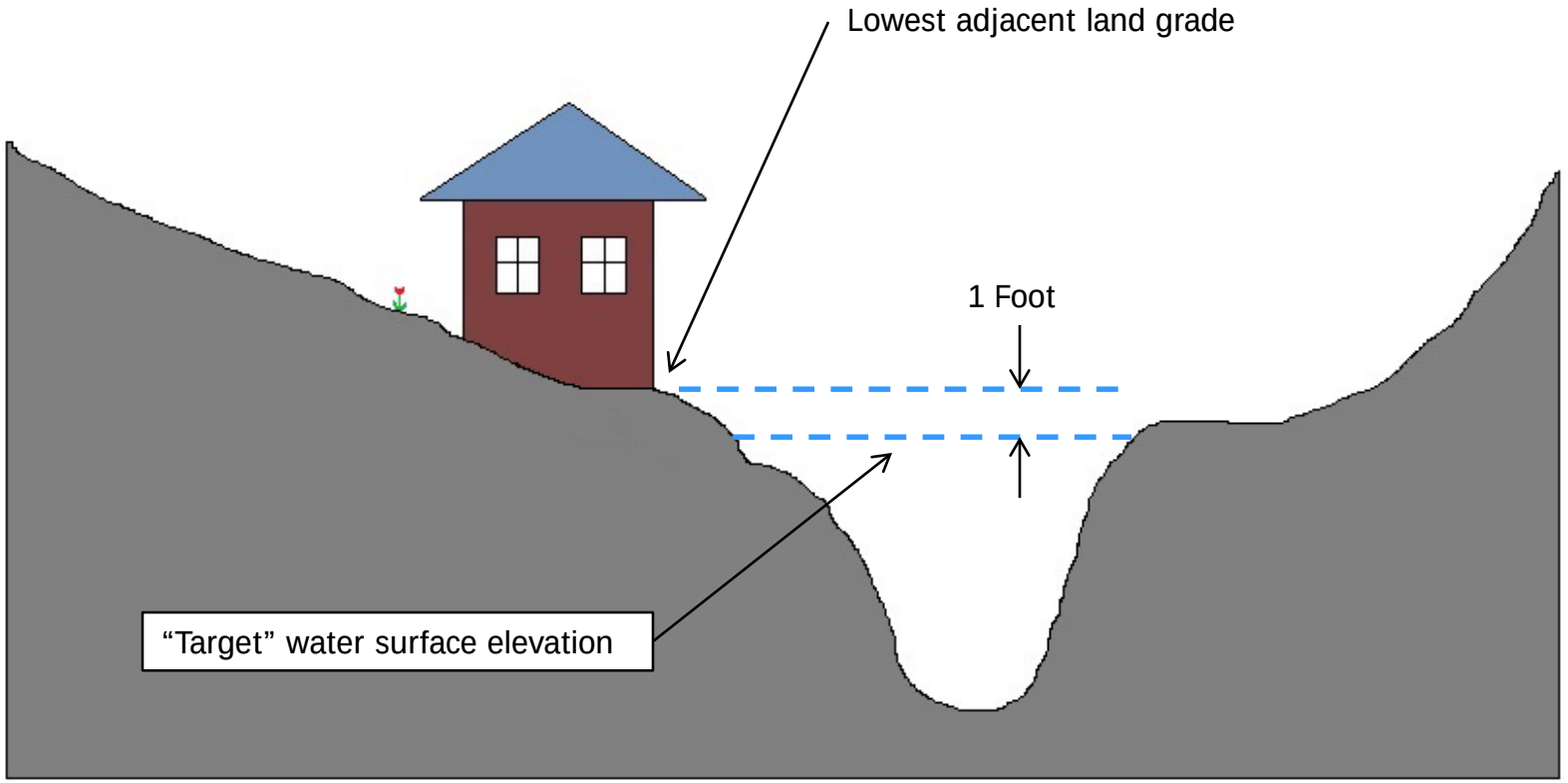
Requires judgment

Evidence of instability?

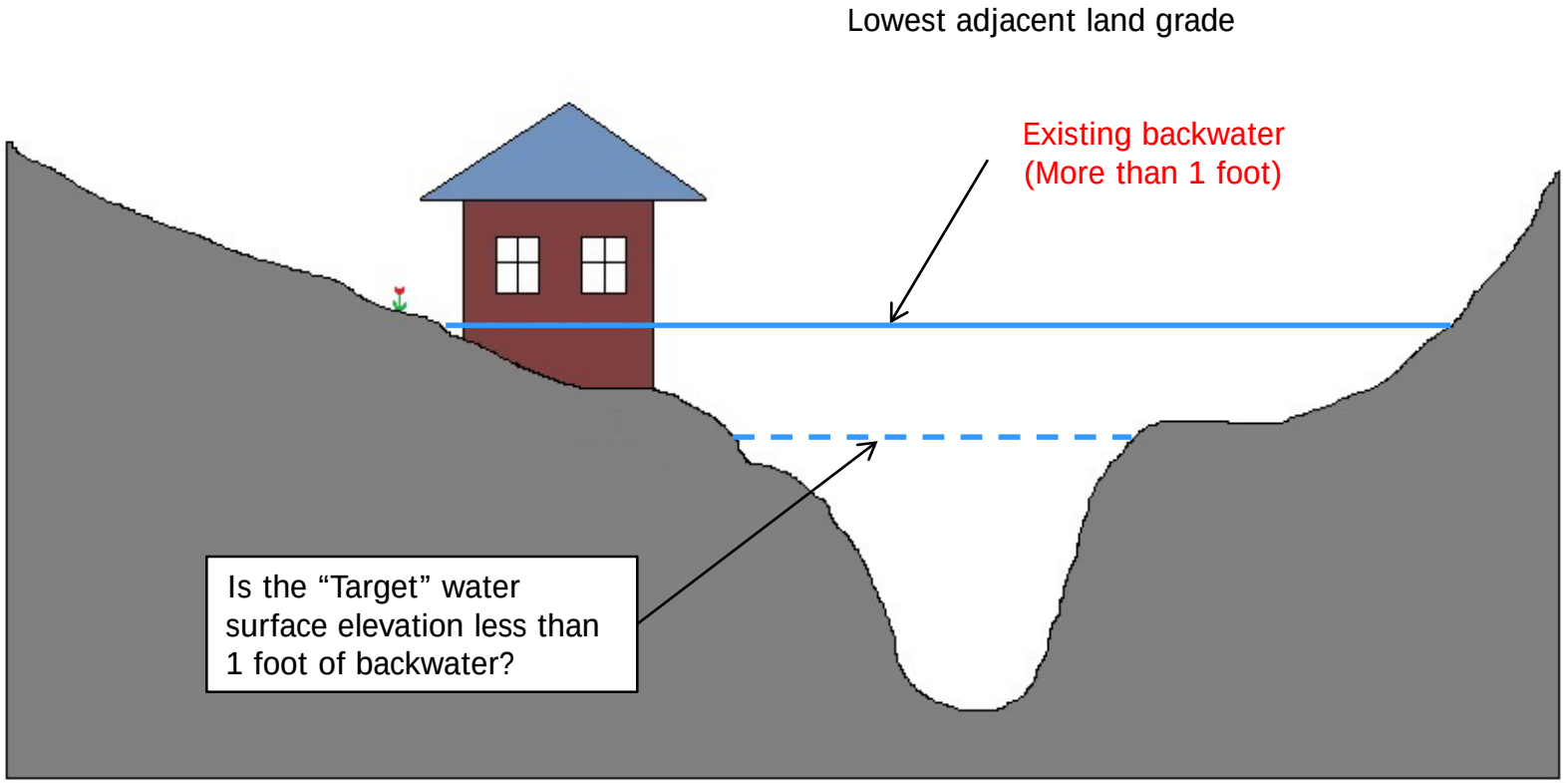
If the existing bridge is unstable, the average velocity in the proposed bridge waterway should be ≤ 1.5 * the downstream channel velocity.

Backwater: U/S structures…

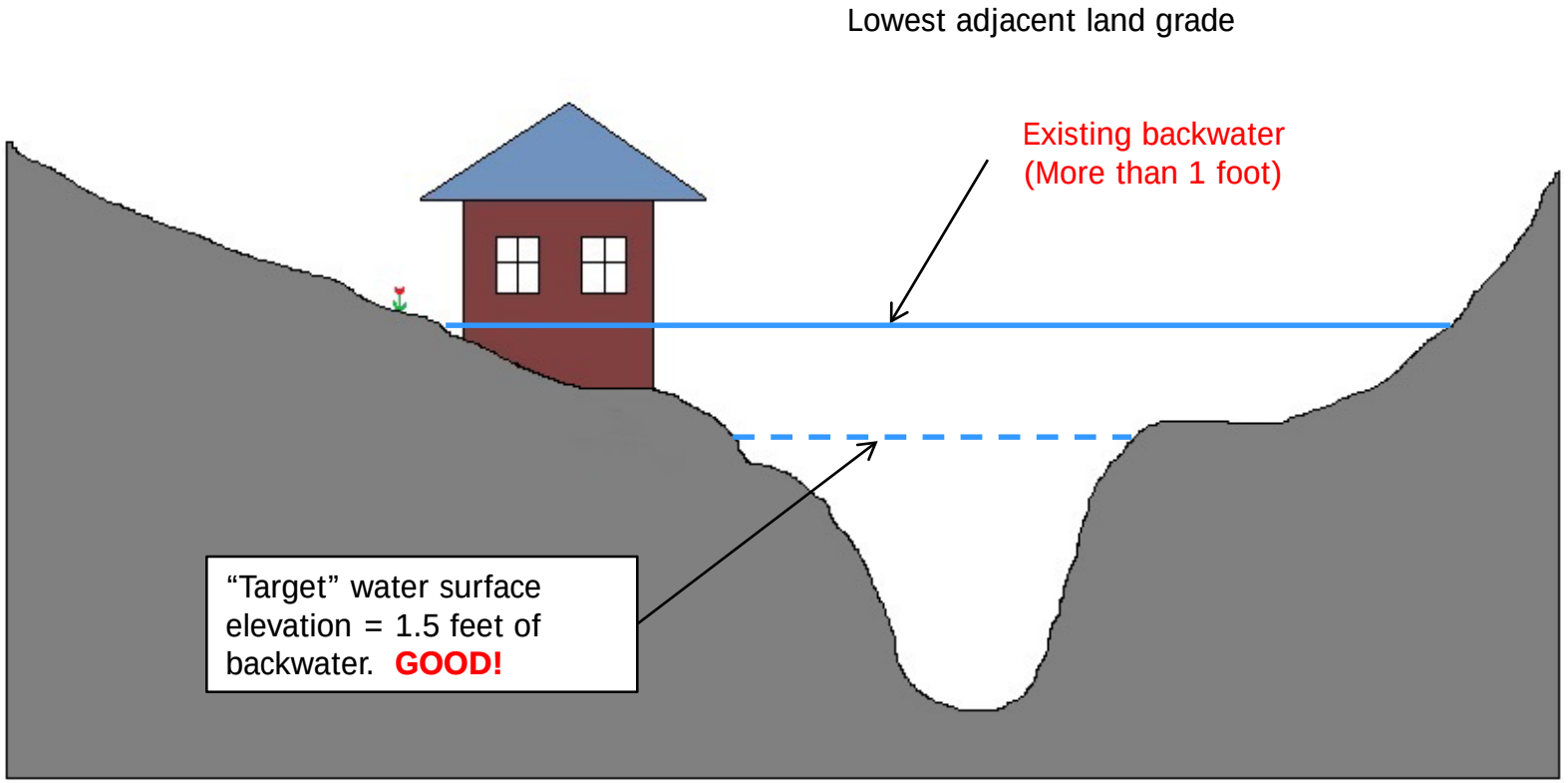
Backwater: U/S structures…



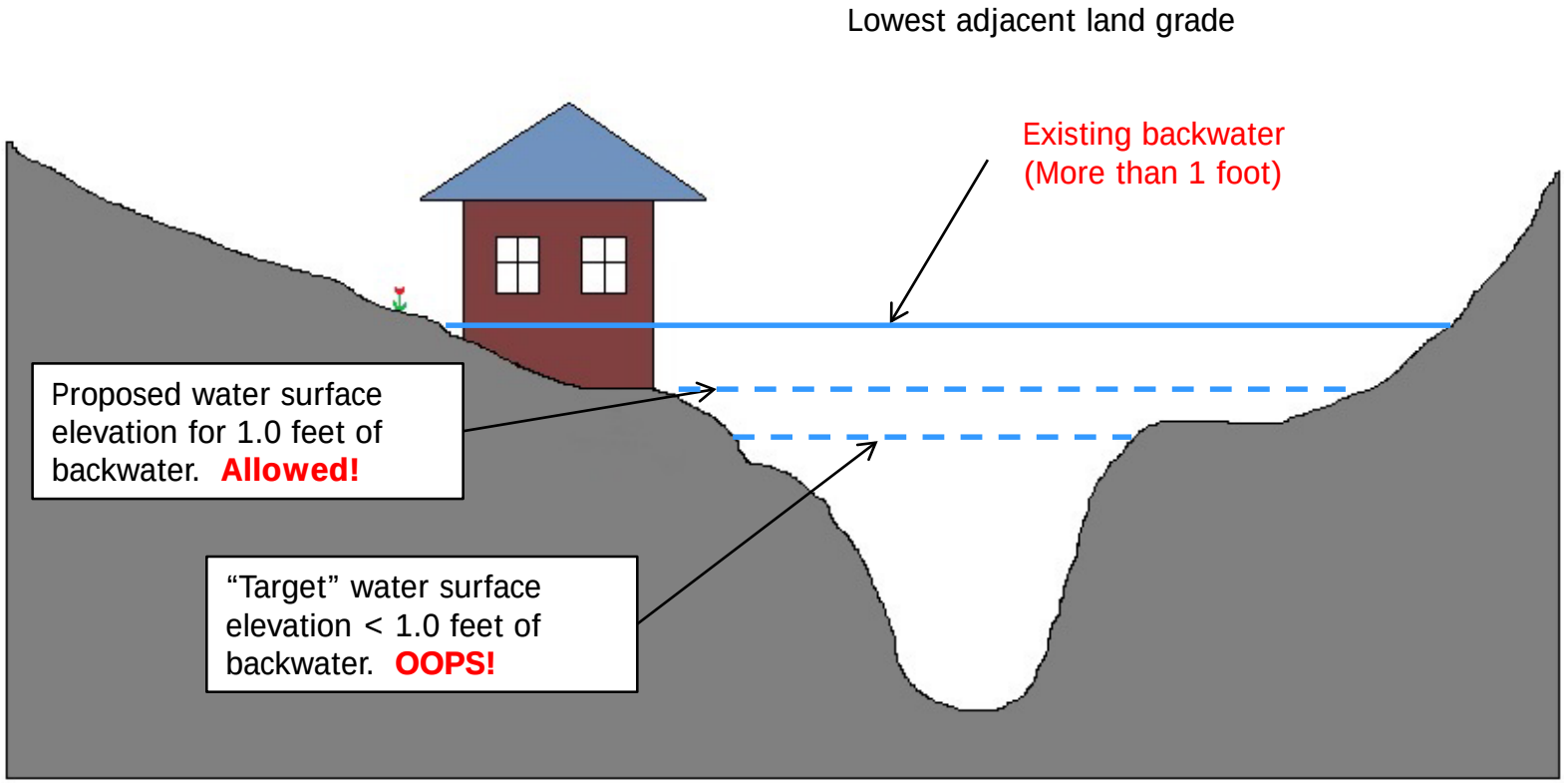
Backwater: U/S structures…



Backwater: U/S structures…

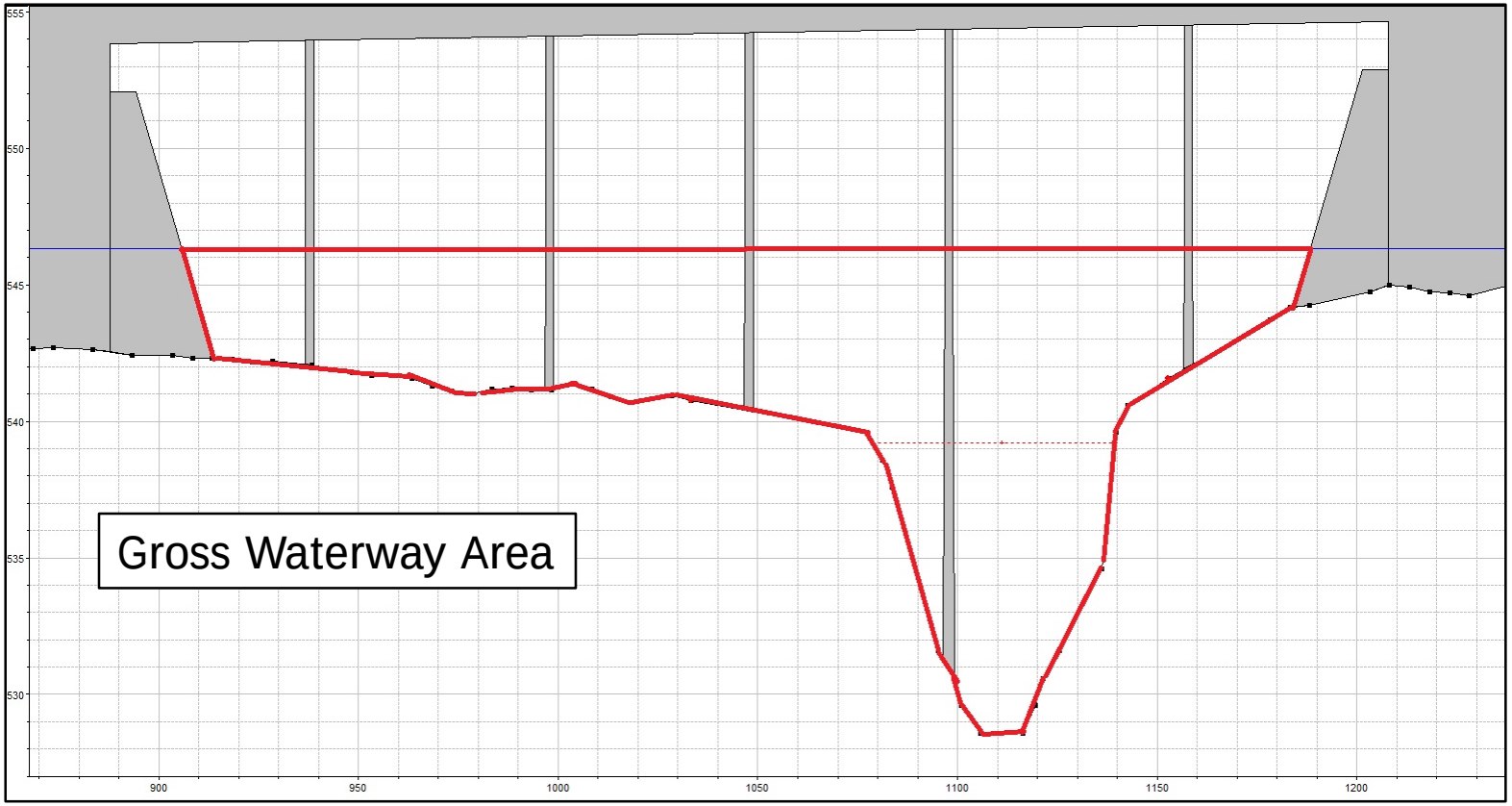


Backwater: U/S structures…



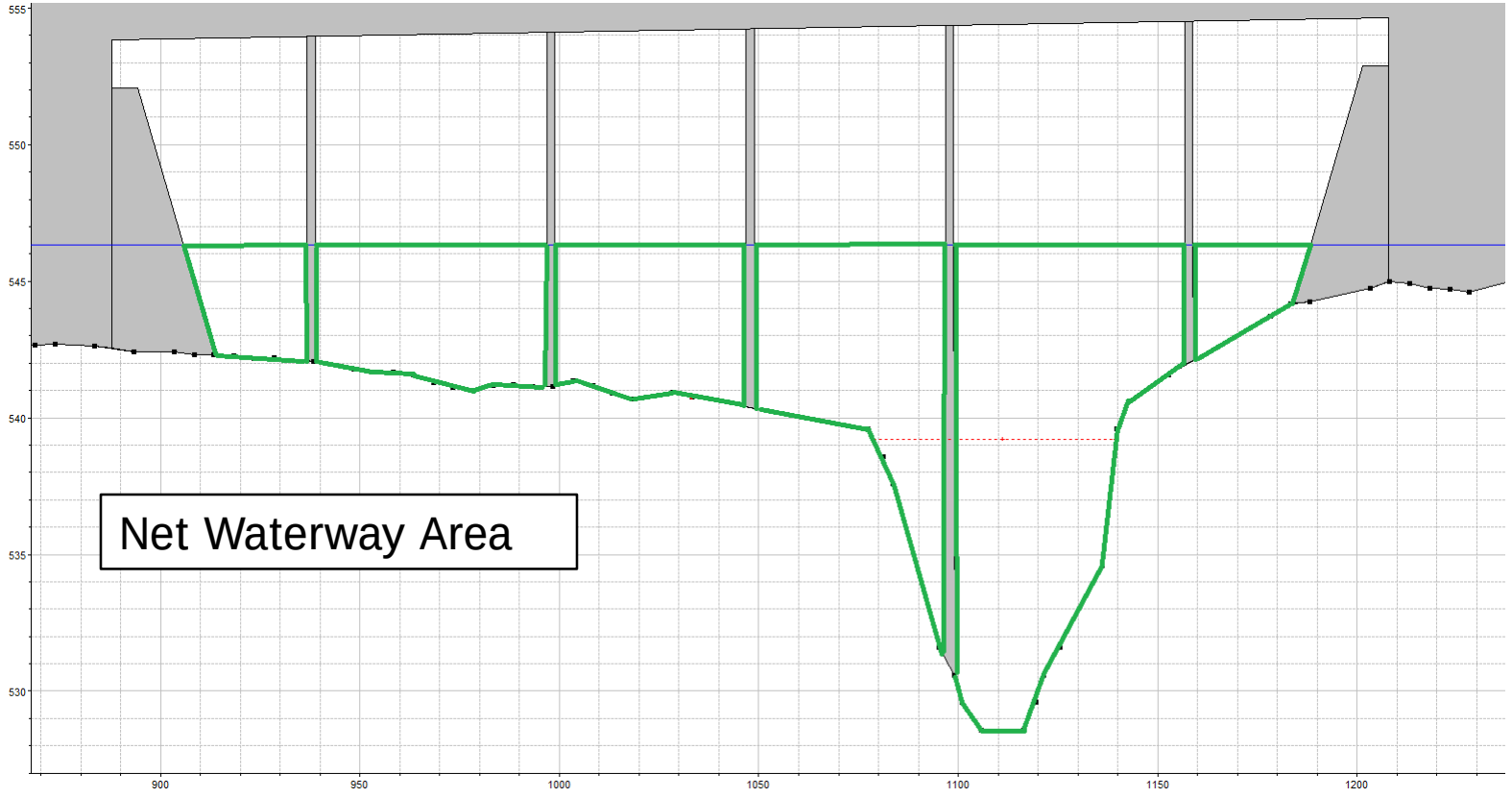
Updates to the IDM Bridge Replacement

Backwater: Waterway areas…



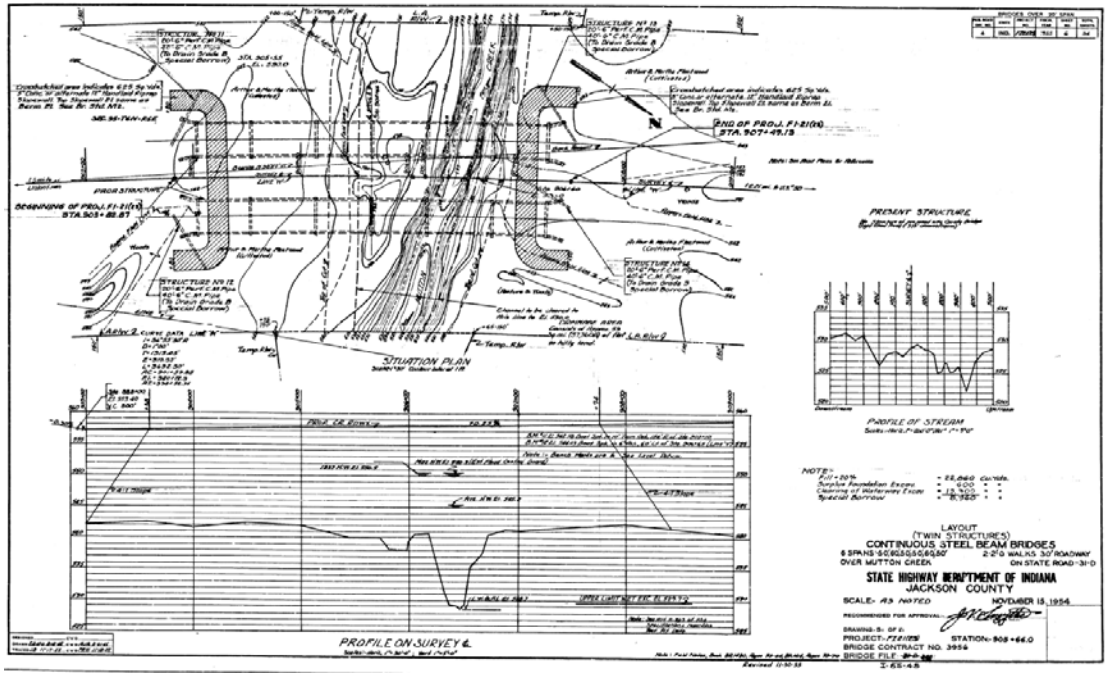
Updates to the IDM Bridge Replacement

Backwater: Waterway areas…



Updates to the IDM Bridge Replacement

Backwater: Waterway areas…



Request plans at: http://www.in.gov/indot/2345.htm

Updates to the IDM Bridge Replacement

Other Criteria: Freeboard…

Current criteria:

Ideal is 2’ or…
maybe 1’ or…
maybe 3’

New criteria:

What do I need to achieve?

Other Criteria: Freeboard…

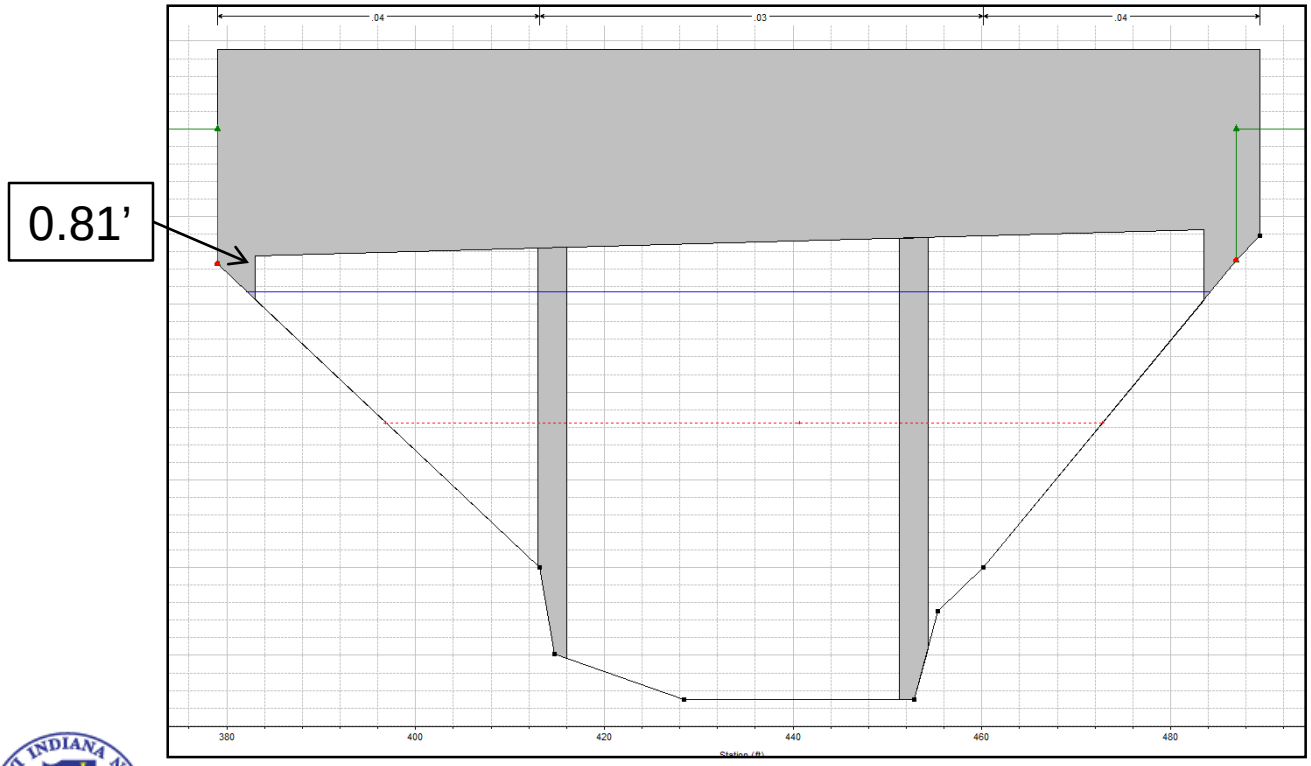
Goal: Meet the existing criteria

Three possibilities:

1. The existing low structures is above the goal
2. The existing low structure is in pressure flow
3. The existing low structure is above the 1% EP elevation, but no pressure flow

Other Criteria: Freeboard…

Matching existing freeboard

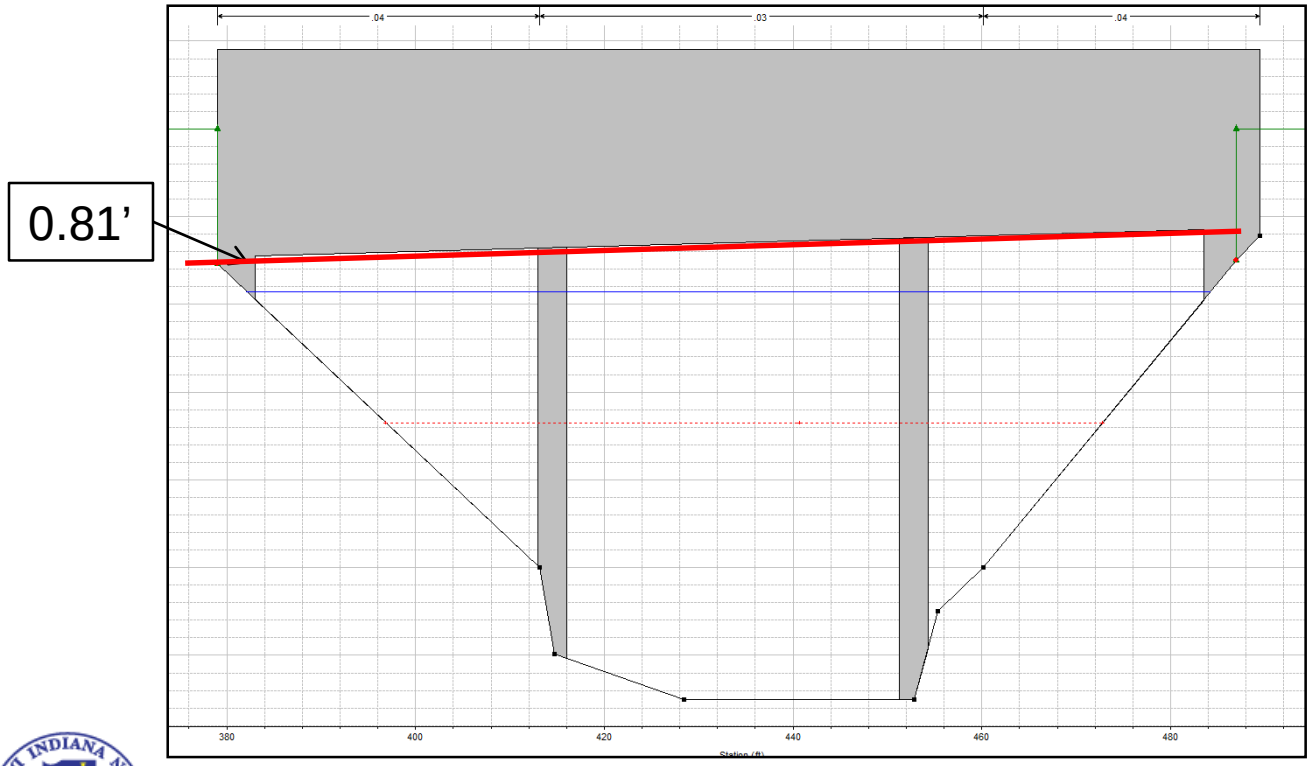


Debris issues?

Yes: Meet the current criteria

Other Criteria: Freeboard…

Matching existing freeboard



Debris issues?

Yes: Meet the current Criteria

No: Can match the PROFILE

Two-Span Structures

Updates to the IDM

Culvert REPLACEMENT Updates…

Replacement in Kind…

Updates to the IDM

Culvert REPLACEMENT Updates…

~~**Replacement in Kind…**~~ **Is now the main policy!**

Updates to the IDM Culvert Replacement

~~**Replacement in Kind…**~~ **Is now the main policy!**

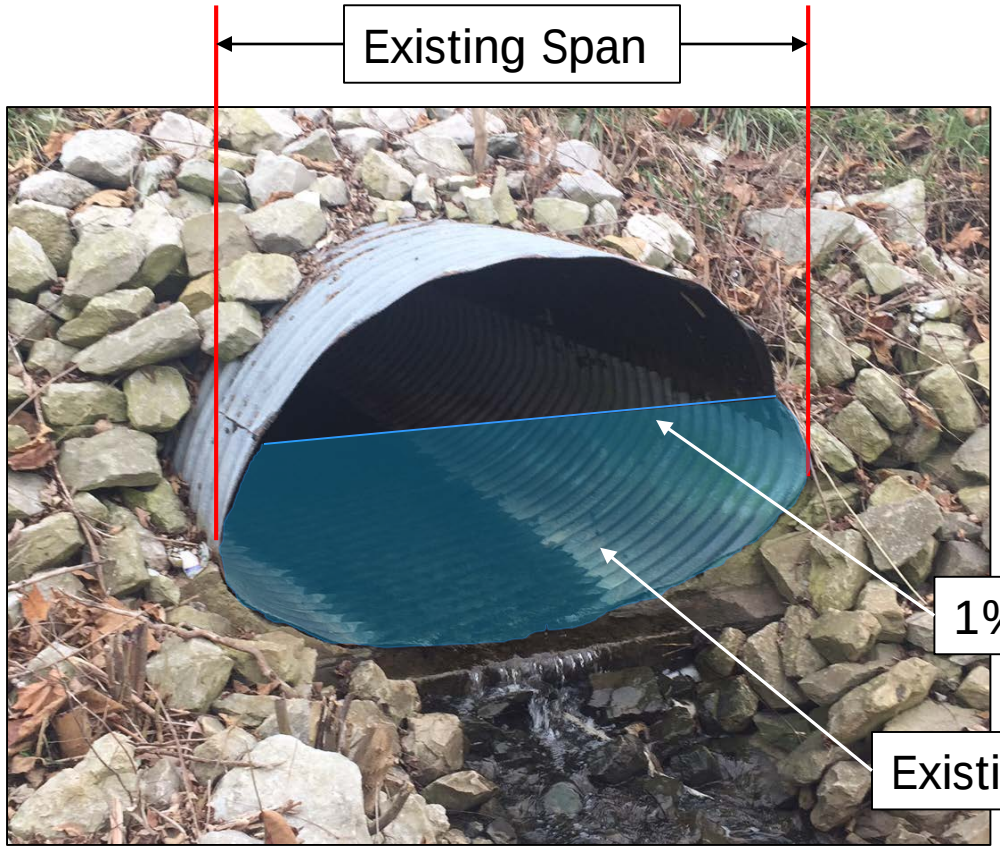
Backwater…

Proposed backwater can be as much as 3 feet *provided* is less than the existing backwater

But what if an upstream structure would be affected? See the bridge design criteria…

Updates to the IDM Culvert Replacement

Other Criteria…



Span and Waterway Area:

Proposed ≥ Existing

Updates to the IDM Culvert Replacement

Other Criteria…

Outlet Velocity ≤ 1.5 x Channel Velocity

Does the pipe have a scour issue?

Updates to the IDM Culvert Replacement

Other Criteria…

Outlet Velocity ≤ 1.5 x Channel Velocity

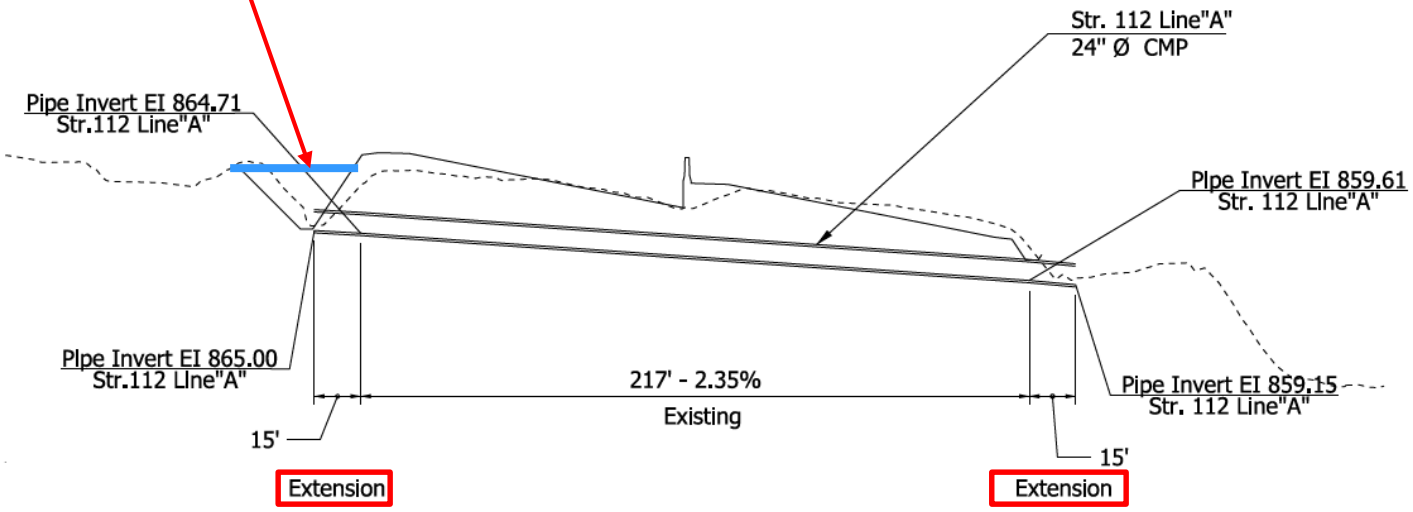
Exceptions:

- **Minimum outlet velocity = 6.5 ft/sec**
- **1 foot of backwater**

Culvert Extension

If the culvert is extended, what happens to the headwater here?

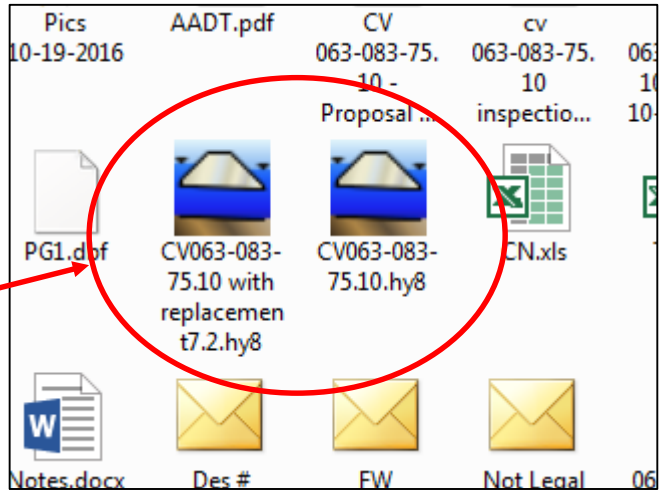
- **The headwater elevation has to stay the same**
- **Remember: HEADwater, not BACKwater**
- **How to deal with that?**



Updates to the IDM Culvert Replacement

Other Things…

When making a submittal, include the electronic files – and mention the version that is used.



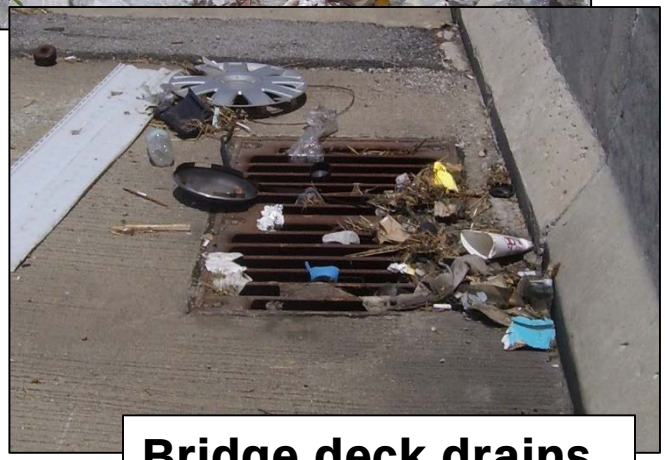
Is there concern about downstream impacts? Contact the Office of Hydraulics.

Updates to the IDM

Inlet Spacing Design

50% Clogging Factor…

REQUIRED



Bridge deck drains

NOT REQUIRED

Sags with flanking inlets

Flanking Inlets…

Required for curb and gutter sections.

Required for median and side ditches unless there is a good place for the water to go.

Updates to the IDM

Pipe Cover

New set of standard drawings…
Cover is now based on pipe type and size

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 (Min.) 18 3/4 (Typ.)	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9 (Min.) 20 3/4 (Typ.)	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12 (Min.) 22 7/8 (Typ.)	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14 (Min.) 20 7/8 (Typ.)	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14 (Min.) 22 5/8 (Typ.)	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16 (Min.) 24 3/8 (Typ.)	95	67	37.0							1.2	17.1	1.2	17.1
16 (Min.) 26 1/8 (Typ.)	103	71	42.4							1.2	16.9	1.2	16.9
18 (Min.) 27 3/4 (Typ.)	112	75	48.0									1.3	16.5

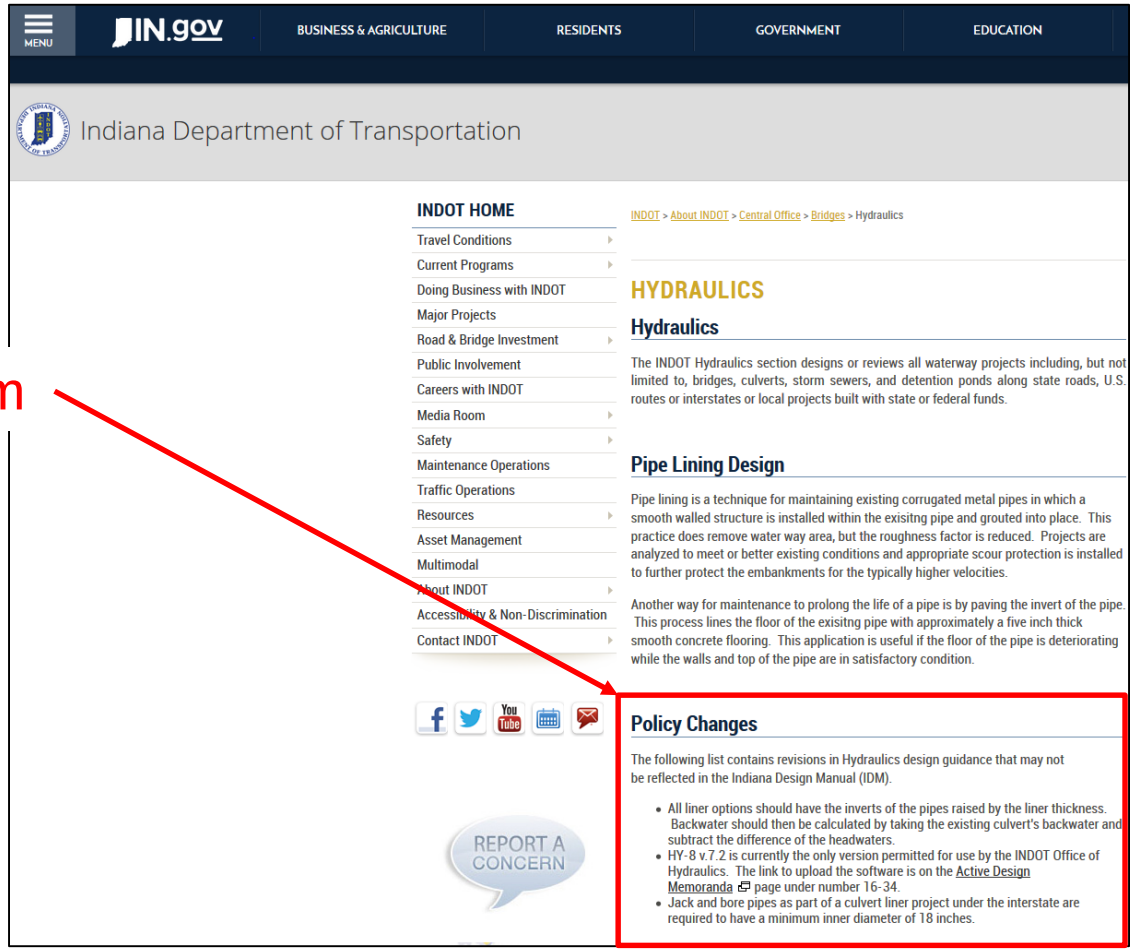
Updates to the IDM

More to come…

Culvert Lining and more…

Find information on the INDOT Hydraulics website

http://in.gov/indot/3595.htm



THANKS

Hydraulics Updates to the IndianaDesign Manual

Mark Bailey, PE
Manager, INDOT Office of Hydraulics

mbailey1@indot.in.gov

David Finley, PE
INDOT Hydraulics Engineer

dfinley@indot.in.gov

March 8, 2017